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(71)Applicant : **FUJITSU LTD**
FUJITSU VLSI LTD

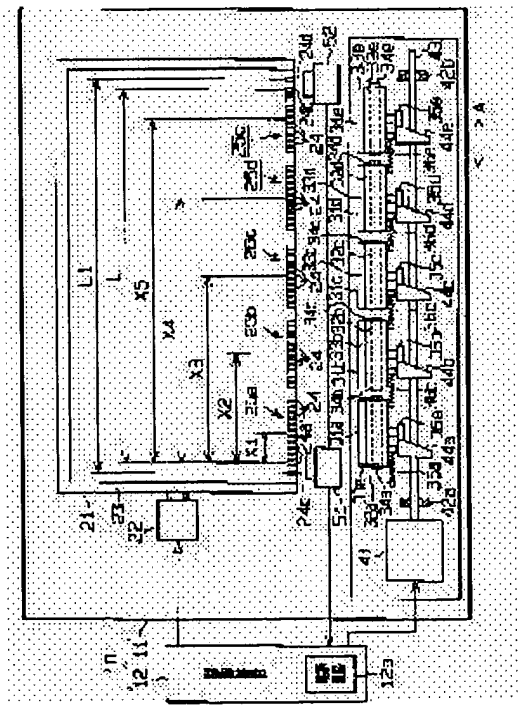
(72)Inventor : **FUKUDA HISASHI**
ADACHI TSUKASA

(54) ALIGNING DEVICE AND PANEL INSPECTION DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide the aligning device which can accurately connect the electrodes of a large display panel and inspection terminals.

SOLUTION: At respective contact units 31a-31e of a panel testing device 10, inspection probes 33a-33e, which are connected to a plurality of electrodes 24 constituting electrode groups 25a-25e, are respectively provided at the positions in correspondence with a plurality of the electrode groups 25a-25e. At the edge cams 44a-44e, the displacement amounts are set in correspondence with the ratio between a distance L between reference terminals 24a and 24b and the distance from the preset reference electrode 24a to the position representing the respective electrode groups 25a-25e. A controller 12 measures the deviation amount of a panel under test 23 from the images of cameras 51 and 52, rotates and drives the edge cams 44a-44e by the angle in correspondence with the deviation amount and moves the respective contact units 31a-31e.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] It is alignment equipment which determines the location of the checking probe linked to the electrode arranged along the circumference of an examined panel. In the side of an examined panel The electrode group which consists of two or more electrodes estranges mutually, two or more formation is carried out, and it has the checking probe connected to two or more electrodes which constitute said electrode group, respectively. Two or more contact units prepared in the location corresponding to said two or more electrode groups, respectively, Alignment equipment equipped with an amount measurement means of gaps to measure the amount of gaps of an examined panel, and the proportionality migration means to which said two or more contact units are proportionally moved-like according to the amount of gaps of said measurement result.
[Claim 2] The camera which captures the image of the electrode of the both ends where said amount measurement means of gaps was arranged along the side of said examined panel, A range measurement means to measure the inter-electrode distance of said both ends based on said image, It is alignment equipment according to claim 1 to which consist of difference operation means to calculate a difference with the distance between reference terminals used as the criteria beforehand remembered to be the inter-electrode distance of said measurement result, and it was made for said proportionality migration means to move each probe unit-like proportionally based on the amount of gaps of said result of an operation.
[Claim 3] Said proportionality migration means is alignment equipment according to claim 2 to which it was made to move each probe unit-like proportionally based on the amount of gaps of said result of an operation after moving the electrode of the end arranged in the side of said examined panel to the reference electrode location set up beforehand.
[Claim 4] The guide rail with which said proportionality migration means supports said each contact unit movable along the side where said electrode was arranged, It is prepared corresponding to the cam follower with which said each contact unit was equipped, and said each contact unit. The distance between said reference terminals, Alignment equipment according to claim 1 to 3 which consisted of a cam to which the amount of displacement was set according to the ratio with the distance to the location which represents each electrode group from the electrode used as the criteria set up beforehand, respectively, and a driving means which carries out the rotation drive of said cam according to said amount of gaps.
[Claim 5] The guide rail with which said proportionality migration means supports said each contact unit movable along the side where said electrode was arranged, The rotation drive driving means [shaft] based on said amount of gaps, and the main working side pulley with which said shaft was equipped, The follower side pulley by which a rotation drive is carried out through a timing belt with said main working side pulley, A rotation drive is carried out by said follower side pulley, and it consists of ball screws to which said contact unit is moved by the rotation. One of said main working side pulley, a follower side pulley, and ball screws Or alignment equipment according to claim 1 to 3 set as the ratio with the distance to the location which represents each electrode group from the electrode used as the criteria beforehand set up with the distance between said reference terminals in the movement magnitude of each of said contact unit with two or more combination.
[Claim 6] Panel test equipment equipped with alignment equipment according to claim 1 to 5, the clamp unit which connects said checking probe to said inspected panel, and the checking drive circuit which supplies a checking electrical signal to an inspected panel through said checking probe.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the alignment equipment and panel test equipment which connect the checking terminal which supplies a signal to the electrode of the display panel used for flat-surface display displays, such as PDP.
[0002] In recent years, development of an indicating equipment is remarkable and especially the flat-surface display has spread quickly from the thin shape and which lightweight description. Plasma panel display (PDP:PlasumaDisplay Panel) It is the next-generation flat-surface display display which replaces the conventional tooth-back projection mold display (CRT) as an indicating equipment of a large-sized screen.
[0003] Before assembling the PDP as a display, quality inspection of the display electrode terminal train in a display-panel simple substance and all-points LGT inspection of a display device are conducted. It is necessary to connect the probe unit for supplying an electrical signal from a checking drive circuit to the electrode of a panel for the inspection with a sufficient precision (probing).
[0004]
[Description of the Prior Art] Conventionally, when supplying a driving signal to a display electrode in panel test equipment, such as LCD, there are some which carry out location ****** of the probe unit equipped with the checking terminal corresponding to all electrodes using a TV camera etc. After the alignment, an electrical signal is supplied from a checking drive circuit through a checking terminal to a display electrode, and inspection of the pixel defect of a panel etc. is conducted.
[0005] by the way -- recent years -- plasma panel display (PDP:Plasuma DisplayPanel) etc. -- since the large-sized screen is formed while making display-panel color display possible -- the magnitude of the whole panel -- ** -- while becoming large, the number of display pixels is also increasing.
[0006] As shown in drawing 5 , two or more electrodes 2 are formed in the display panel 1, for example, the glass panel of PDP, along the side of a panel 1. The number of electrodes 2, the electrode width of face W, and the electrode pitch P are determined by the number of pixels which can be displayed as the magnitude of a panel 1 by the panel 1.
[0007]
[Problem(s) to be Solved by the Invention] However, although it is suitable in the above-mentioned panel test equipment in inspecting a small display panel since one probe unit is equipped with all checking terminals, in the case of a large-sized display panel, there are the following problems like the panel 1 shown in drawing 5 .
[0008] (1) The glass display panel 1 is the effect of heat treatment at an electrode processing process, telescopic motion of the display panel itself may occur, and the electrode pitch of a display electrode may shift from the dimension at the time of a design greatly. For example, when inter-electrode [of both ends] is the panel which is 920mm, since a module varies about 1/1000 at the maximum, an electrode location gap produces electrode pitch accuracy from a design value about 0.92mm.
[0009] (2) Since a coefficient of thermal expansion is 9x10^-6-/degree C, for example, if 10 degrees C

of temperature of a panel 1 change, a 0.08mm electrode location gap will produce the glass display panel 1 from a design value.
[0010] Therefore, supposing the above-mentioned electrode gap occurs in max, the distance L between electrode 2a of the both ends shown in drawing 5 and 2b will shift from a design value no less than 1.00mm. And it is large-sized and, in the case of a display panel with many pixels, the width of face and the pitch of an electrode 2 are very small compared with distance L. For example, in the case of the panel 1 shown in drawing 5 , it is formed in the electrode pitch of P= 0.3mm, and electrode width of face of W= 0.15mm. Therefore, there was a problem of it becoming impossible to connect with a precision sufficient to the electrode 2 aiming at the terminal of a probe unit.
[0011] It is made in order that this invention may solve the above-mentioned trouble, and the purpose is in offering the alignment equipment which can connect the electrode and checking terminal of a large-sized display panel with a sufficient precision.
[0012] Moreover, it is in offering the panel test equipment which can connect the electrode and checking terminal of a large-sized display panel with a sufficient precision, and can inspect a display panel.
[0013]
[Means for Solving the Problem] This invention in order to attain the above-mentioned purpose claim 1 invention It is alignment equipment which determines the location of the checking probe linked to the electrode arranged along the circumference of an examined panel. In the side of an examined panel The electrode group which consists of two or more electrodes estranges mutually, two or more formation is carried out, and it has the checking probe connected to two or more electrodes which constitute said electrode group, respectively. Two or more contact units prepared in the location corresponding to said two or more electrode groups, respectively, Let it be a summary to have had an amount measurement means of gaps to measure the amount of gaps of an examined panel, and the proportionality migration means to which said two or more contact units are proportionally moved-like according to the amount of gaps of said measurement result.
[0014] Claim 2 invention is set to alignment equipment according to claim 1. Said amount measurement means of gaps The camera which captures the image of the electrode of the both ends arranged along the side of said examined panel, A range measurement means to measure the inter-electrode distance of said both ends based on said image, Consisting of difference operation means to calculate a difference with the distance between reference terminals used as the criteria beforehand remembered to be the inter-electrode distance of said measurement result, said proportionality migration means makes it a summary to have made it move each probe unit-like proportionally based on the amount of gaps of said result of an operation.
[0015] Claim 3 invention makes it a summary to have made it move each probe unit-like proportionally based on the amount of gaps of said result of an operation, after said proportionality migration means moved the electrode of the end arranged in the side of said examined panel to the reference electrode location set up beforehand in alignment equipment according to claim 2.
[0016] Claim 4 invention is set to alignment equipment according to claim 1 to 3. Said proportionality migration means The guide rail which supports said each contact unit movable along the side where said electrode was arranged, It is prepared corresponding to the cam follower with which said each contact unit was equipped, and said each contact unit. The distance between said reference terminals, According to a ratio with the distance to the location which represents each electrode group from the electrode used as the criteria set up beforehand, the amount of displacement makes it a summary to have consisted of a cam set up, respectively and a driving means which carries out the rotation drive of said cam according to said amount of gaps.
[0017] Claim 5 invention is set to alignment equipment according to claim 1 to 3. Said proportionality migration means The guide rail which supports said each contact unit movable along the side where said electrode was arranged, The rotation drive driving means [shaft] based on said amount of gaps, and the main working side pulley with which said shaft was equipped, The follower side pulley by which a rotation drive is carried out through a timing belt with said main working side pulley, A rotation drive is carried out by said follower side pulley, and it consists of ball screws to which said contact unit is

moved by the rotation. One of said main working side pulley, a follower side pulley, and ball screws Or let it be a summary to have set it as the ratio with the distance to the location which represents each electrode group from the electrode used as the criteria beforehand set up with the distance between said reference terminals in the movement magnitude of each of said contact unit with two or more combination.

[0018] Claim 6 invention makes it a summary to have had alignment equipment according to claim 1 to 5, the clamp unit which connects said checking probe to said inspected panel, and the checking drive circuit which supplies a checking electrical signal to an inspected panel through said checking probe.

[0019] (Operation) Therefore, according to invention according to claim 1, in the side of an examined panel, the electrode group which consists of two or more electrodes estranges mutually, and two or more formation is carried out in it. It has the checking probe connected to two or more electrodes which constitute an electrode group, respectively, and a contact unit is prepared in the location corresponding to two or more electrode groups, respectively. And the amount measurement means of gaps measures the amount of gaps of an examined panel, and a proportionality migration means moves two or more contact units-like proportionally according to the amount of gaps of a measurement result.

[0020] According to invention according to claim 2, the amount measurement means of gaps consists of a camera and a range measurement means Tosa operation means. A camera captures the image of the electrode of the both ends arranged along the side of an examined panel. A range measurement means measures the inter-electrode distance of both ends based on the captured image. A difference operation means calculates a difference with the distance between reference terminals used as the criteria beforehand remembered to be the inter-electrode distance of a measurement result. And a proportionality migration means moves each probe unit-like proportionally based on the amount of gaps of the result of an operation.

[0021] According to invention according to claim 3, a proportionality migration means moves each probe unit-like proportionally based on the amount of gaps of the result of an operation, after moving the electrode of the end arranged in the side of an examined panel to the reference electrode location set up beforehand.

[0022] According to invention according to claim 4, a guide rail, a cam follower, a cam, and a driving means are consisted of by the proportionality migration means. A guide rail supports each contact unit movable along the side where the electrode was arranged. A cam is prepared corresponding to each contact unit, the cam follower with which the contact unit was equipped is contacted, and the amount of displacement is set up according to the ratio of the distance between reference terminals, and the distance to the location which represents each electrode group from the electrode used as the criteria set up beforehand, respectively. And a driving means shifts and carries out the rotation drive of the cam according to an amount.

[0023] According to invention according to claim 5, a proportionality migration means is equipped with a guide rail, a driving means, the main working side pulley, a follower side pulley, and a ball screw. Each contact unit is supported movable along the side where the electrode was arranged with a guide rail. As for a driving means, the shaft is rotation-drive-equipped with the main working side pulley in a shaft based on the amount of gaps. The rotation drive of the follower side pulley is carried out through a timing belt by the main working side pulley, and a contact unit is moved by rotation of the follower side pulley with a ball screw. And it is set as a ratio with the distance to the location which represents each electrode group from the electrode used as the criteria beforehand set up with the distance between reference terminals in the movement magnitude of each contact unit with 1 of the main working side pulley, a follower side pulley, and ball screws, or two combination or more.

[0024] According to invention according to claim 6, it has alignment equipment according to claim 1 to 5, the clamp unit which connects a checking probe to an inspected panel, and the checking drive circuit which supplies a checking electrical signal to an inspected panel through a checking probe.

[0025]

[Embodiment of the Invention] Hereafter, the gestalt of the 1 operation which materialized this invention is explained according to drawing 1 - drawing 3 . Drawing 1 </A> is the outline block diagram

of the panel testing device 10. The panel testing device 10 consists of a contact 11 and a control unit 12. First, the configuration of a contact 11 is explained.
[0026] The stage 21 is established in the contact 11. If a stepping motor 22 is formed in a stage 21 and the stepping motor 22 drives, along with the guide rail which is not illustrated, it will move in the direction of arrow-head A on a stage 21. Installation immobilization is carried out at a position with the fixture which the examined panels 23, such as PDP, do not illustrate in a stage 21.
[0027] Two or more electrodes 24 are formed in two or more predetermined sides of the examined panel 23 along each side, respectively. In addition, only the electrode 24 formed along the one side is shown in drawing 1 on account of explanation.
[0028] The electrode 24 is formed in the predetermined electrode width of face W and the electrode pitch P (refer to drawing 5). Moreover, for every predetermined number, an electrode 24 opens fixed spacing, is formed, and constitutes the electrode groups 25a-25e of plurality (this operation gestalt five).
[0029] Therefore, predetermined spacing is opened mutually, it estranges and each electrode groups 25a-25e are formed while being formed along the one side. Moreover, the distance from any 1 way of the electrodes 24 (hereafter, in order to distinguish from other electrodes 24, it considers as Electrodes 24a and 24b) of both ends is beforehand set up for the location (for example, center position of each electrode groups 25a-25e) which represents each electrode groups 25a-25e, respectively.
[0030] In addition, with this operation gestalt, the distance of each electrode groups 25a-25e is set up from electrode 24a of the side equipped with the stepping motor 22 in drawing 1 , and the distance X1, X2, X3, X4, and X5 of each electrode groups 25a-25e is set up beforehand.
[0031] Moreover, the contact units 31a-31e of plurality (this operation gestalt five) are formed in the contact 11. Each contact units 31a-31e are formed corresponding to the electrode groups 25a-25e of the examined panel 23, respectively.
[0032] The probe units 32a-32e are formed in each contact units 31a-31e, respectively. Each probe units 32a-32e are equipped with the checking probes 33a-33e, respectively.
[0033] it is shown in drawing 2 -- as -- the checking probes 33a-33e -- flexiblity -- it consists of the possible quality of the material, for example, a flexible substrate, and is fixed to the probe units 32a-32e, respectively. The bump who does not illustrate is formed at the tip (right end) of each checking probes 33a-33e. The bump is prepared at intervals of the number corresponding to the number of the electrodes 24 which constitute each electrode groups 25a-25e. By pushing these bumps against an electrode 23, the checking signal outputted from power circuit 12a mentioned later is supplied to the examined panel 23 from each electrode 24.
[0034] The guide rails 34a-34e as a proportionality migration means are formed in each contact units 31a-31e, respectively. Each contact units 31a-31e are supported movable with each guide rails 34a-34e along the side of the examined panel 23 in which the electrode 24 was formed.
[0035] The cam followers 35a-35e as a proportionality migration means are formed in each contact units 31a-31e, respectively. Springs 36a-36e are formed in each contact units 31a-31e, respectively.
[0036] As shown in drawing 2 , the clan ** unit 37 as a press means is formed in contact unit 31a. The clamp unit 37 consists of an air cylinder 38 and a clamper 39 which drives by the air cylinder 38 and rotates, and the bump who was prepared at the tip of checking probe 33a by the clamper 39 and who does not illustrate is pushed against the electrode (it omits in drawing 2) of the examined panel 23.
[0037] Moreover, the guide rail 40 is formed in contact unit 31a. Contact unit 31a and the clamp unit 37 are movable to the examined panel 23 along with the guide rail 40 in the attachment-and-detachment direction (it sets to drawing 2 and is a longitudinal direction) while being supported with a guide rail 40. By this configuration, contact unit 31a and the clamp unit 37 are made to estrange from the examined panel 23, and attachment and detachment of that examined panel 23 are made easy.
[0038] In addition, in drawing 1 , contact unit 31a is omitted in order to avoid that a drawing becomes complicated. Moreover, the same clamp unit 37 as other contact units 31b-31e is formed, and since the configuration and actuation are the same, a drawing and explanation are omitted.
[0039] Moreover, as shown in drawing 1 , the stepping motor 41 as a driving means is formed in the contact 11. The shaft 43 supported by bearings 42a and 42b is fixed to revolve by the stepping motor 41.

The end cams 44a-44e as a proportionality migration means corresponding to the contact units 31a-31e are being fixed to the shaft 43.
[0040] End cams 44a-44e are being fixed to the location corresponding to 31e, i.e., the location corresponding to the electrode groups 25a-25e formed in the examined panel 23, from each contact unit 31a. As shown in drawing 3 (a), cam follower 35a prepared in contact unit 31a is contacted by end-cam 44a. Furthermore, as shown in drawing 1 , contact unit 31a is energized leftward [of drawing 1] by spring 36a.
[0041] Therefore, if a shaft 43 rotates with the stepping motor 41 shown in drawing 1 , cam follower 35a will move in the direction of a right arrow in drawing by end-cam 44a by the rotation. Consequently, contact unit 31a shown in drawing 1 moves rightward [drawing] along the side of the examined panel 23 by guide-rail 34a. Moreover, as shown in drawing 1 , contact unit 31a is energized leftward [of drawing 1] by spring 36a. Therefore, since cam follower 35a shown in drawing 3 is not estranged from end-cam 44a, contact unit 31a moves leftward [of drawing 1]. In addition, since other contact units 31b-31e are the same as contact unit 31a, explanation is omitted.
[0042] Moreover, as shown in the cam diagram with which the amount of displacement to which cam followers 35a-35e are moved is shown in drawing 3 (b), each end cams 44a-44e are set up by end-cam 44e of the right end in drawing 1 so that the amount of displacement may become large. Moreover, the amount of displacement of each end cams 44a-44e is set up corresponding to the ratio of the location of each contact units 31a-31e, i.e., the location of each electrode groups 25a-25e of the examined panel 23.
[0043] The distance to the location (this operation gestalt core of each electrode groups 25a-26e) which specifically represents each electrode groups 25a-25e from electrode 24a of the edge used as criteria is set as distance X1, X2, X3, X4, and X5. And distance between electrode 24a of both ends and 24b is made into distance L. When the examined panel 23 expands and contracts, a gap of each electrode groups 25a-25e is proportional to the value which broke each distance X1-X5 with the distance dimension L which serves as criteria, respectively. That is, if the amount of gaps of each electrode groups 25a-25e is made into the amounts delta X1-delta X5 of gaps, respectively, each amounts delta X1-delta X5 of gaps are proportional to (X2/L), (X3/L), (X4/L), and (X5/L), respectively (X1/L). Therefore, the ratio (cam ratio) of the amount of displacement of each end cams 44a-44e is set up so that it may become :(X1/L) (X2/L):(X3/L):(X4/L): (X5/L).
[0044] Therefore, if a shaft 43 rotates with a stepping motor 41, according to the angle of rotation of the end cams 44a-44e fixed to the shaft 43, each contact units 31a-31e will move according to the ratio of the location of the distance X1 from electrode 24a to each electrode groups 25a-25e used as criteria.
[0045] Furthermore, as shown in drawing 1 , one pair of cameras 51 and 52 as an amount measurement means of gaps are formed in the contact 11 again. Cameras 51 and 52 are formed in order to measure the gap to the criteria panel generated on the examined panel 23. Both the cameras 51 and 52 are installed in the location which serves as criteria beforehand. The location used as criteria is a location corresponding to the terminals 24a and 24b of the both ends on the design of the examined panel 23. In addition, in drawing 1 , although both the cameras 51 and 52 are shown between the examined panel 23 and the contact units 31a and 33e, as shown in drawing 2 , they are arranged in fact, by the fastener which is not illustrated to the edge upper part of the examined panel 23.
[0046] Both the cameras 51 and 52 incorporate electrode 24a of the both ends of the examined panel 23, and near 24b as an image. And both the cameras 51 and 52 output the image captured, respectively to a control unit 12.
[0047] Next, a control unit 12 is explained. The control unit 12 as the amount measurement means of gaps, a proportionality migration means, a range measurement means, a difference operation means, and a driving means consists of a computer, and the checking program for inspecting the examined panel 23 is stored beforehand. Stepping motors 22 and 41 are connected to the control unit 12.
[0048] Moreover, power circuit 12a is prepared in the control unit 12. Power circuit 12a is a checking drive circuit which outputs the electrical signal for inspecting the examined panel 23, and although omitted by a diagram, it is connected to the checking probes 33a-33e of each contact units 31a-31e.
[0049] A control unit 12 measures the amount of gaps of the examined panel 23 based on a checking

program. Based on the measurement result, a control unit 12 carries out drive control of the stepping motors 22 and 45, and performs each electrode groups 25a-25e of the examined panel 23, and alignment of each contact units 31a-31e. And a control unit 12 controls the air cylinder 38 shown in drawing 2 , and connects the checking probes 33a-33e to each electrode 24 of the examined panel 23 using a clamper 39. Furthermore, a control device 12 supplies a checking electrical signal to the examined panel 23 through the checking probes 33a-33e from power circuit 12a, and examines the examined panel 23.
[0050] A control unit 12 operates based on the checking program memorized beforehand, connects the checking probes 33a-33e to each electrode groups 25a-25e of the examined panel 23, supplies a checking electrical signal to the examined panel 23 through the checking probes 33a-33e from power circuit 12a, and examines the examined panel 23.
[0051] In the checking program, a control unit 12 measures the amount of gaps of the examined panel 23 first. Based on the image data inputted from cameras 51 and 52, it is carried out to measurement of the amount of gaps.
[0052] Based on the image obtained with both the cameras 51 and 52, as for a control unit 12, the terminals 24a and 24b of the both ends of the examined panel 23 measure the distance L1 between terminals by to which location of a screen it is reflected, respectively.
[0053] In addition, in drawing 1 , the location of an electrode 24 is illustrated as a location on a design, and shows only the terminal 24 of both ends in the actual examined panel 23 among the effect of heat treatment at an electrode processing process, and the terminal 24 which shifted by thermal expansion etc. In order to distinguish the terminal 24 of these both ends when shifting, and the terminals 24a and 24b of the both ends on a design, let the terminals 24 of both ends when a location shifts hereafter be Terminals 24c and 24d. Moreover, the fictitious display panel as a design dimension is hereafter called criteria panel. That is, the terminal 24 shown in drawing 1 is the terminal location of a criteria panel, and Terminals 24c and 24d show the terminal location of the examined panel 23.
[0054] Therefore, a control unit 12 measures the distance L1 for terminal 24c of examined panel 23 both ends, and 24d based on the image obtained with both the cameras 51 and 52. Moreover, the distance L between terminal 24a of criteria panel both ends and 24b is beforehand memorized by the control unit 12. A control unit 12 calculates amount of gaps deltaL produced on the examined panel 23 based on the distance L beforehand remembered to be the measured distance L1. The amount of gaps deltaL turns into deltaL=L1-L.
[0055] Based on this calculated amount of gaps deltaL, as for a control unit 12, the examined panel 23 judges whether it is an accepted product. When amount of gaps deltaL is below a predetermined value, a control unit 12 judges the examined panel 23 at that time to be an accepted product, and, as for a control unit 12, in beyond a predetermined value, a control unit 12 judges the examined panel 23 at that time to be rejected goods. The value used as this decision criterion is set up based on the maximum movable amount of the contact units 31a-31e.
[0056] That is, let the examined panel 23 which shifted, so that it cannot cancel, namely, a gap of the examined panel 23 could not connect the checking probes 33a-33e to each electrode 24 of the examined panel 23, even if the contact units 31a-31e moved to max be rejected goods. For example, in this operation gestalt, when the maximum movable amount is set to 2mm, the control unit 12 is set up so that the examined panel 23 within the limits whose amount of gaps deltaL is 0-1mm may be judged as an accepted product.
[0057] When the examined panel 23 is an accepted product, next, a control device 12 carries out drive control of the stepping motor 22, moves a stage 21, and moves terminal 24c of the examined panel 23 to the location of terminal 24a of a criteria panel. Next, it shifts and only the include angle corresponding to the amount of gaps deltaL which carried out drive control and calculated the stepping motor 41 rotates [control unit / 12] end cams 44a-44e based on amount deltaL.
[0058] Then, each contact units 31a-31e move according to the ratio of the amount of gaps of the examined panel 23, and the location of each electrode groups 25a-25e, respectively. Consequently, each contact units 31a-31e move to the location which faces each electrode groups 25a-25e. And a control unit 12 controls the clamp unit 37 of each contact units 31a-31e, and connects the checking probes 33a-

33e to an electrode 24.
[0059] At this time, as for each end cams 44a-44e, the cam ratio is set as :(X1/L) (X2/L):(X3/L):(X4/L):(X5/L). Therefore, only the amount based on amount of gaps deltaL and the cam ratio of each end cams 44a-44e moves the movement magnitude of each contact units 31a-31e.
[0060] And the movement magnitude of each contact units 31a-31e becomes almost equal to the amount of gaps of each electrode groups 25a-25e. For example, it is less than 0.05 degrees of errors of a stepping motor 41. This is based on the drive number of steps per rotation of a stepping motor 41. And most, when movement magnitude is end-cam 44e set up greatly, that movement magnitude shall serve as max, when that 180 degrees end-cam 44e rotates, and this movement magnitude shall be set as 2mm. Then, the error of the movement magnitude in this case is set to abbreviation 0.5x10^-3mm (= 0.5 microns). Since it is very small compared with the electrode width of face W (= 0.15mm) and the electrode pitch P (= 0.3mm), effect does not have the error of this movement magnitude in connection of an electrode 24 and the checking probes 33a-33e.
[0061] And after connection between the checking probes 33a-33e and an electrode 24 is completed, a control device 12 supplies a checking electrical signal to the examined panel 23 through each checking probes 33a-33e from power circuit 12a, makes the examined panel 23 turn on, and inspects the examined panel 23.
[0062] In addition, in drawing 1 , only the device which carries out alignment of the checking probes 33a-33e to the electrode formed in one side of the examined panel 23 is shown. And in fact, the electrode is formed in two or more sides of the examined panel 23, and the checking probe connected to the electrode formed each side is prepared. However, since the configuration and actuation of the alignment of a checking probe to the electrode formed each side are the same respectively, the drawing of the configuration to other sides and explanation of operation are omitted.
[0063] According to the gestalt of this operation, the following effectiveness is done so as described above.
(1) In the side of the examined panel 23, the electrode groups 25a-25e which consist of two or more electrodes 24 estrange mutually, and two or more formation is carried out in it. The panel testing device 10 is equipped with the contact units 31a-31e corresponding to each electrode groups 25a-25e. Each contact units 31a-31e are equipped with the checking probes 33a-33e connected to two or more electrodes 24 which constitute the electrode groups 25a-25e, respectively, and it is prepared in the location corresponding to two or more electrode groups 25a-25e, respectively. Moreover, the cam followers 35a-35e with which each contact units 31a-31e were equipped are contacted by the end cams 44a-44e to which the amount of displacement was set, respectively according to a ratio with the distance to the location which represents each electrode groups 25a-25e from reference-terminal 24a and electrode 24a used as the distance L between 24b, and the criteria set up beforehand, respectively. And the control unit 12 measured the amount of gaps of the examined panel 23, and only the include angle according to the amount of gaps carries out the rotation drive of the end cams 44a-44e, and it was made to move each contact units 31a-31e based on the image obtained with cameras 51 and 52.
[0064] Consequently, since each contact units 31a-31e move as they responded to the amount of gaps of each electrode groups 25a-25e, they move each contact units 31a-31e to the location which faces each electrode groups 25a-25e. Therefore, even if the location of an electrode 24 shifts by effect, thermal expansion, etc. of heat treatment of the large-sized examined panel 23, precision can improve each electrode groups 25a-25e and each contact units 31a-31e alignment. And it is connectable with a precision sufficient to the electrode 24 aiming at the checking probes 33a-33e.
[0065] In addition, this invention may be carried out in the following modes besides the gestalt of said operation.
(1) In the above-mentioned operation gestalt, replace with end cams 44a-44e, and carry out using a cam with various solid cams, such as plane cams, such as a face cam and a grooved cam, a cylindrical cam, and a conical cam, etc.
[0066] (2) Although the proportionality migration means to which each contact units 31a-31e are moved according to the amount of gaps of the electrode groups 25a-25e using end cams 44a-44e, respectively

was constituted from an above-mentioned operation gestalt, the configuration of the migration means may be suitably changed into the configuration using a pulley, a link mechanism, etc., and may be carried out.

[0067] For example, as shown in drawing 4 , the main working side pulley 51 really attached in the shaft 43 pivotable and the follower side pulley 52 formed in the contact unit 31a side are connected by the timing belt 53. A ball screw 54 is really attached in the follower side pulley 52 pivotable, and contact unit 31a moves to it along with guide-rail 34a through the joint section 55 according to rotation of the ball screw 54. And the radius of the main working side pulley 51 is proportionally changed-like according to the location of each contact units 31a-31e. By this configuration, the same effectiveness as the above-mentioned operation gestalt is done so.

[0068] Moreover, in the configuration shown in drawing 4 , the radius of the main working side pulley 51 is made the same in each contact units 31a-31e, and the radius of the follower side pulley 52 is changed-like proportionally. Moreover, the radius of the main working side pulley 51 and the follower side pulley 52 is made the same, and the pitch of a ball screw 54 is changed. Furthermore, make the radius of the follower side pulley 53 the same, and let movement magnitude of the contact units 31a-31e be proportionality with the main working side pulley 51 and the pitch of a ball screw 54. Furthermore, the movement magnitude of a contact unit is set up again with the follower side pulley 52, a ball screw 54 and the main working side pulley 51, the follower side pulley 52, and the pitch of a ball screw 54. In any case of these, the same effectiveness as the above-mentioned operation gestalt is done so.

[0069] (3) Equip each contact units 31a-31e with a stepping motor 41 in the above-mentioned operation gestalt. In this case, only the same include angle carries out the rotation drive of the stepping motor with which each contact units 31a-31e were equipped in the end cams 44a-44e of the above-mentioned operation gestalt, and each end cams 44a-44e are rotated.

[0070] Moreover, the end cams 44a-44e of each contact units 31a-31e are made into the same configuration (the amount of displacement is the same), and a control unit 12 sets the pulse number which drives the stepping motor with which each contact units 31a-31e were equipped, respectively as the value proportional corresponding to each units 31a-31e, and supplies it to each stepping motor. Also by this configuration, movement magnitude serves as proportionality, respectively and each contact units 31a-31e can improve [precision] the checking probes 33a-33e alignment to an electrode 24.

[0071] (4) With the above-mentioned operation gestalt, although the case of five contact units 31a-31e was explained, change the number of contact units into four or less pieces or six pieces or more suitably, and carry it out, for example.

[0072] (5) Apply to test equipment, such as flat-surface display panels other than PDP, for example, a liquid crystal display panel, (LCD), the EL (electro luminescent display) panel, and FED, as an examined panel 23 in the above-mentioned operation gestalt.

[0073]

[Effect of the Invention] As explained in full detail above, according to invention according to claim 1 to 5, the alignment equipment which can connect the electrode and checking terminal of a large-sized display panel with a sufficient precision can be offered.

[0074] Moreover, according to invention according to claim 6, the panel test equipment which can be inspected by connecting the electrode and checking terminal of a large-sized display panel with a sufficient precision can be offered.

[Translation done.]

MEANS

[Means for Solving the Problem] This invention in order to attain the above-mentioned purpose claim 1 invention It is alignment equipment which determines the location of the checking probe linked to the electrode arranged along the circumference of an examined panel. In the side of an examined panel The electrode group which consists of two or more electrodes estranges mutually, two or more formation is carried out, and it has the checking probe connected to two or more electrodes which constitute said electrode group, respectively. Two or more contact units prepared in the location corresponding to said two or more electrode groups, respectively, Let it be a summary to have had an amount measurement means of gaps to measure the amount of gaps of an examined panel, and the proportionality migration means to which said two or more contact units are proportionally moved-like according to the amount of gaps of said measurement result.
[0014] Claim 2 invention is set to alignment equipment according to claim 1. Said amount measurement means of gaps The camera which captures the image of the electrode of the both ends arranged along the side of said examined panel, A range measurement means to measure the inter-electrode distance of said both ends based on said image, Consisting of difference operation means to calculate a difference with the distance between reference terminals used as the criteria beforehand remembered to be the inter-electrode distance of said measurement result, said proportionality migration means makes it a summary to have made it move each probe unit-like proportionally based on the amount of gaps of said result of an operation.
[0015] Claim 3 invention makes it a summary to have made it move each probe unit-like proportionally based on the amount of gaps of said result of an operation, after said proportionality migration means moved the electrode of the end arranged in the side of said examined panel to the reference electrode location set up beforehand in alignment equipment according to claim 2.
[0016] Claim 4 invention is set to alignment equipment according to claim 1 to 3. Said proportionality migration means The guide rail which supports said each contact unit movable along the side where said electrode was arranged, It is prepared corresponding to the cam follower with which said each contact unit was equipped, and said each contact unit. The distance between said reference terminals, According to a ratio with the distance to the location which represents each electrode group from the electrode used as the criteria set up beforehand, the amount of displacement makes it a summary to have consisted of a cam set up, respectively and a driving means which carries out the rotation drive of said cam according to said amount of gaps.
[0017] Claim 5 invention is set to alignment equipment according to claim 1 to 3. Said proportionality migration means The guide rail which supports said each contact unit movable along the side where said electrode was arranged, The rotation drive driving means [shaft] based on said amount of gaps, and the main working side pulley with which said shaft was equipped, The follower side pulley by which a rotation drive is carried out through a timing belt with said main working side pulley, A rotation drive is carried out by said follower side pulley, and it consists of ball screws to which said contact unit is moved by the rotation. One of said main working side pulley, a follower side pulley, and ball screws Or let it be a summary to have set it as the ratio with the distance to the location which represents each electrode group from the electrode used as the criteria beforehand set up with the distance between said reference terminals in the movement magnitude of each of said contact unit with two or more combination.
[0018] Claim 6 invention makes it a summary to have had alignment equipment according to claim 1 to 5, the clamp unit which connects said checking probe to said inspected panel, and the checking drive circuit which supplies a checking electrical signal to an inspected panel through said checking probe.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

OPERATION

(Operation) Therefore, according to invention according to claim 1, in the side of an examined panel, the electrode group which consists of two or more electrodes estranges mutually, and two or more formation is carried out in it. It has the checking probe connected to two or more electrodes which constitute an electrode group, respectively, and a contact unit is prepared in the location corresponding to two or more electrode groups, respectively. And the amount measurement means of gaps measures the amount of gaps of an examined panel, and a proportionality migration means moves two or more contact units-like proportionally according to the amount of gaps of a measurement result.

[0020] According to invention according to claim 2, the amount measurement means of gaps consists of a camera and a range measurement means Tosa operation means. A camera captures the image of the electrode of the both ends arranged along the side of an examined panel. A range measurement means measures the inter-electrode distance of both ends based on the captured image. A difference operation means calculates a difference with the distance between reference terminals used as the criteria beforehand remembered to be the inter-electrode distance of a measurement result. And a proportionality migration means moves each probe unit-like proportionally based on the amount of gaps of the result of an operation.

[0021] According to invention according to claim 3, a proportionality migration means moves each probe unit-like proportionally based on the amount of gaps of the result of an operation, after moving the electrode of the end arranged in the side of an examined panel to the reference electrode location set up beforehand.

[0022] According to invention according to claim 4, a guide rail, a cam follower, a cam, and a driving means are consisted of by the proportionality migration means. A guide rail supports each contact unit movable along the side where the electrode was arranged. A cam is prepared corresponding to each contact unit, the cam follower with which the contact unit was equipped is contacted, and the amount of displacement is set up according to the ratio of the distance between reference terminals, and the distance to the location which represents each electrode group from the electrode used as the criteria set up beforehand, respectively. And a driving means shifts and carries out the rotation drive of the cam according to an amount.

[0023] According to invention according to claim 5, a proportionality migration means is equipped with a guide rail, a driving means, the main working side pulley, a follower side pulley, and a ball screw. Each contact unit is supported movable along the side where the electrode was arranged with a guide rail. As for a driving means, the shaft is rotation-drive-equipped with the main working side pulley in a shaft based on the amount of gaps. The rotation drive of the follower side pulley is carried out through a timing belt by the main working side pulley, and a contact unit is moved by rotation of the follower side pulley with a ball screw. And it is set as a ratio with the distance to the location which represents each electrode group from the electrode used as the criteria beforehand set up with the distance between reference terminals in the movement magnitude of each contact unit with 1 of the main working side pulley, a follower side pulley, and ball screws, or two combination or more.

[0024] According to invention according to claim 6, it has alignment equipment according to claim 1 to 5, the clamp unit which connects a checking probe to an inspected panel, and the checking drive circuit which supplies a checking electrical signal to an inspected panel through a checking probe.

[0025]

[Embodiment of the Invention] Hereafter, the gestalt of the 1 operation which materialized this invention is explained according to drawing 1 - drawing 3 . Drawing 1 is the outline block diagram of the panel testing device 10. The panel testing device 10 consists of a contact 11 and a control unit 12. First, the configuration of a contact 11 is explained.

[0026] The stage 21 is established in the contact 11. If a stepping motor 22 is formed in a stage 21 and the stepping motor 22 drives, along with the guide rail which is not illustrated, it will move in the direction of arrow-head A on a stage 21. Installation immobilization is carried out at a position with the fixture which the examined panels 23, such as PDP, do not illustrate in a stage 21.
[0027] Two or more electrodes 24 are formed in two or more predetermined sides of the examined panel 23 along each side, respectively. In addition, only the electrode 24 formed along the one side is shown in drawing 1 on account of explanation.
[0028] The electrode 24 is formed in the predetermined electrode width of face W and the electrode pitch P (refer to drawing 5). Moreover, for every predetermined number, an electrode 24 opens fixed spacing, is formed, and constitutes the electrode groups 25a-25e of plurality (this operation gestalt five).
[0029] Therefore, predetermined spacing is opened mutually, it estranges and each electrode groups 25a-25e are formed while being formed along the one side. Moreover, the distance from any 1 way of the electrodes 24 (hereafter, in order to distinguish from other electrodes 24, it considers as Electrodes 24a and 24b) of both ends is beforehand set up for the location (for example, center position of each electrode groups 25a-25e) which represents each electrode groups 25a-25e, respectively.
[0030] In addition, with this operation gestalt, the distance of each electrode groups 25a-25e is set up from electrode 24a of the side equipped with the stepping motor 22 in drawing 1 , and the distance X1, X2, X3, X4, and X5 of each electrode groups 25a-25e is set up beforehand.
[0031] Moreover, the contact units 31a-31e of plurality (this operation gestalt five) are formed in the contact 11. Each contact units 31a-31e are formed corresponding to the electrode groups 25a-25e of the examined panel 23, respectively.
[0032] The probe units 32a-32e are formed in each contact units 31a-31e, respectively. Each probe units 32a-32e are equipped with the checking probes 33a-33e, respectively.
[0033] it is shown in drawing 2 -- as -- the checking probes 33a-33e -- flexiblity -- it consists of the possible quality of the material, for example, a flexible substrate, and is fixed to the probe units 32a-32e, respectively. The bump who does not illustrate is formed at the tip (right end) of each checking probes 33a-33e. The bump is prepared at intervals of the number corresponding to the number of the electrodes 24 which constitute each electrode groups 25a-25e. By pushing these bumps against an electrode 23, the checking signal outputted from power circuit 12a mentioned later is supplied to the examined panel 23 from each electrode 24.
[0034] The guide rails 34a-34e as a proportionality migration means are formed in each contact units 31a-31e, respectively. Each contact units 31a-31e are supported movable with each guide rails 34a-34e along the side of the examined panel 23 in which the electrode 24 was formed.
[0035] The cam followers 35a-35e as a proportionality migration means are formed in each contact units 31a-31e, respectively. Springs 36a-36e are formed in each contact units 31a-31e, respectively.
[0036] As shown in drawing 2 , the clan ** unit 37 as a press means is formed in contact unit 31a. The clamp unit 37 consists of an air cylinder 38 and a clamper 39 which drives by the air cylinder 38 and rotates, and the bump who was prepared at the tip of checking probe 33a by the clamper 39 and who does not illustrate is pushed against the electrode (it omits in drawing 2) of the examined panel 23.
[0037] Moreover, the guide rail 40 is formed in contact unit 31a. Contact unit 31a and the clamp unit 37 are movable to the examined panel 23 along with the guide rail 40 in the attachment-and-detachment direction (it sets to drawing 2 and is a longitudinal direction) while being supported with a guide rail 40. By this configuration, contact unit 31a and the clamp unit 37 are made to estrange from the examined panel 23, and attachment and detachment of that examined panel 23 are made easy.
[0038] In addition, in drawing 1 , contact unit 31a is omitted in order to avoid that a drawing becomes complicated. Moreover, the same clamp unit 37 as other contact units 31b-31e is formed, and since the configuration and actuation are the same, a drawing and explanation are omitted.
[0039] Moreover, as shown in drawing 1 , the stepping motor 41 as a driving means is formed in the contact 11. The shaft 43 supported by bearings 42a and 42b is fixed to revolve by the stepping motor 41. The end cams 44a-44e as a proportionality migration means corresponding to the contact units 31a-31e are being fixed to the shaft 43.
[0040] End cams 44a-44e are being fixed to the location corresponding to 31e, i.e., the location corresponding to the electrode groups 25a-25e formed in the examined panel 23, from each contact unit 31a. As shown in drawing 3 (a), cam follower 35a prepared in contact unit 31a is contacted by end-cam 44a. Furthermore, as

shown in drawing 1 , contact unit 31a is energized leftward [of drawing 1] by spring 36a.
[0041] Therefore, if a shaft 43 rotates with the stepping motor 41 shown in drawing 1 , cam follower 35a will move in the direction of a right arrow in drawing by end-cam 44a by the rotation. Consequently, contact unit 31a shown in drawing 1 moves rightward [drawing] along the side of the examined panel 23 by guide-rail 34a. Moreover, as shown in drawing 1 , contact unit 31a is energized leftward [of drawing 1] by spring 36a. Therefore, since cam follower 35a shown in drawing 3 is not estranged from end-cam 44a, contact unit 31a moves leftward [of drawing 1]. In addition, since other contact units 31b-31e are the same as contact unit 31a, explanation is omitted.
[0042] Moreover, as shown in the cam diagram with which the amount of displacement to which cam followers 35a-35e are moved is shown in drawing 3 (b), each end cams 44a-44e are set up by end-cam 44e of the right end in drawing 1 so that the amount of displacement may become large. Moreover, the amount of displacement of each end cams 44a-44e is set up corresponding to the ratio of the location of each contact units 31a-31e, i.e., the location of each electrode groups 25a-25e of the examined panel 23.
[0043] The distance to the location (this operation gestalt core of each electrode groups 25a-26e) which specifically represents each electrode groups 25a-25e from electrode 24a of the edge used as criteria is set as distance X1, X2, X3, X4, and X5. And distance between electrode 24a of both ends and 24b is made into distance L. When the examined panel 23 expands and contracts, a gap of each electrode groups 25a-25e is proportional to the value which broke each distance X1-X5 with the distance dimension L which serves as criteria, respectively. That is, if the amount of gaps of each electrode groups 25a-25e is made into the amounts delta X1-delta X5 of gaps, respectively, each amounts delta X1-delta X5 of gaps are proportional to (X2/L), (X3/L), (X4/L), and (X5/L), respectively (X1/L). Therefore, the ratio (cam ratio) of the amount of displacement of each end cams 44a-44e is set up so that it may become :(X1/L) (X2/L):(X3/L):(X4/L): (X5/L).
[0044] Therefore, if a shaft 43 rotates with a stepping motor 41, according to the angle of rotation of the end cams 44a-44e fixed to the shaft 43, each contact units 31a-31e will move according to the ratio of the location of the distance X1 from electrode 24a to each electrode groups 25a-25e used as criteria.
[0045] Furthermore, as shown in drawing 1 , one pair of cameras 51 and 52 as an amount measurement means of gaps are formed in the contact 11 again. Cameras 51 and 52 are formed in order to measure the gap to the criteria panel generated on the examined panel 23. Both the cameras 51 and 52 are installed in the location which serves as criteria beforehand. The location used as criteria is a location corresponding to the terminals 24a and 24b of the both ends on the design of the examined panel 23. In addition, in drawing 1 , although both the cameras 51 and 52 are shown between the examined panel 23 and the contact units 31a and 33e, as shown in drawing 2 , they are arranged in fact, by the fastener which is not illustrated to the edge upper part of the examined panel 23.
[0046] Both the cameras 51 and 52 incorporate electrode 24a of the both ends of the examined panel 23, and near 24b as an image. And both the cameras 51 and 52 output the image captured, respectively to a control unit 12.
[0047] Next, a control unit 12 is explained. The control unit 12 as the amount measurement means of gaps, a proportionality migration means, a range measurement means, a difference operation means, and a driving means consists of a computer, and the checking program for inspecting the examined panel 23 is stored beforehand. Stepping motors 22 and 41 are connected to the control unit 12.
[0048] Moreover, power circuit 12a is prepared in the control unit 12. Power circuit 12a is a checking drive circuit which outputs the electrical signal for inspecting the examined panel 23, and although omitted by a diagram, it is connected to the checking probes 33a-33e of each contact units 31a-31e.
[0049] A control unit 12 measures the amount of gaps of the examined panel 23 based on a checking program. Based on the measurement result, a control unit 12 carries out drive control of the stepping motors 22 and 45, and performs each electrode groups 25a-25e of the examined panel 23, and alignment of each contact units 31a-31e. And a control unit 12 controls the air cylinder 38 shown in drawing 2 , and connects the checking probes 33a-33e to each electrode 24 of the examined panel 23 using a clamper 39. Furthermore, a control device 12 supplies a checking electrical signal to the examined panel 23 through the checking probes 33a-33e from power circuit 12a, and examines the examined panel 23.
[0050] A control unit 12 operates based on the checking program memorized beforehand, connects the checking probes 33a-33e to each electrode groups 25a-25e of the examined panel 23, supplies a checking electrical signal to the examined panel 23 through the checking probes 33a-33e from power circuit 12a, and examines the

examined panel 23.
[0051] In the checking program, a control unit 12 measures the amount of gaps of the examined panel 23 first. Based on the image data inputted from cameras 51 and 52, it is carried out to measurement of the amount of gaps.
[0052] Based on the image obtained with both the cameras 51 and 52, as for a control unit 12, the terminals 24a and 24b of the both ends of the examined panel 23 measure the distance L1 between terminals by to which location of a screen it is reflected, respectively.
[0053] In addition, in drawing 1 , the location of an electrode 24 is illustrated as a location on a design, and shows only the terminal 24 of both ends in the actual examined panel 23 among the effect of heat treatment at an electrode processing process, and the terminal 24 which shifted by thermal expansion etc. In order to distinguish the terminal 24 of these both ends when shifting, and the terminals 24a and 24b of the both ends on a design, let the terminals 24 of both ends when a location shifts hereafter be Terminals 24c and 24d. Moreover, the fictitious display panel as a design dimension is hereafter called criteria panel. That is, the terminal 24 shown in drawing 1 is the terminal location of a criteria panel, and Terminals 24c and 24d show the terminal location of the examined panel 23.
[0054] Therefore, a control unit 12 measures the distance L1 for terminal 24c of examined panel 23 both ends, and 24d based on the image obtained with both the cameras 51 and 52. Moreover, the distance L between terminal 24a of criteria panel both ends and 24b is beforehand memorized by the control unit 12. A control unit 12 calculates amount of gaps deltaL produced on the examined panel 23 based on the distance L beforehand remembered to be the measured distance L1. The amount of gaps deltaL turns into deltaL=L1-L.
[0055] Based on this calculated amount of gaps deltaL, as for a control unit 12, the examined panel 23 judges whether it is an accepted product. When amount of gaps deltaL is below a predetermined value, a control unit 12 judges the examined panel 23 at that time to be an accepted product, and, as for a control unit 12, in beyond a predetermined value, a control unit 12 judges the examined panel 23 at that time to be rejected goods. The value used as this decision criterion is set up based on the maximum movable amount of the contact units 31a-31e.
[0056] That is, let the examined panel 23 which shifted, so that it cannot cancel, namely, a gap of the examined panel 23 could not connect the checking probes 33a-33e to each electrode 24 of the examined panel 23, even if the contact units 31a-31e moved to max be rejected goods. For example, in this operation gestalt, when the maximum movable amount is set to 2mm, the control unit 12 is set up so that the examined panel 23 within the limits whose amount of gaps deltaL is 0-1mm may be judged as an accepted product.
[0057] When the examined panel 23 is an accepted product, next, a control device 12 carries out drive control of the stepping motor 22, moves a stage 21, and moves terminal 24c of the examined panel 23 to the location of terminal 24a of a criteria panel. Next, it shifts and only the include angle corresponding to the amount of gaps deltaL which carried out drive control and calculated the stepping motor 41 rotates [control unit / 12] end cams 44a-44e based on amount deltaL.
[0058] Then, each contact units 31a-31e move according to the ratio of the amount of gaps of the examined panel 23, and the location of each electrode groups 25a-25e, respectively. Consequently, each contact units 31a-31e move to the location which faces each electrode groups 25a-25e. And a control unit 12 controls the clamp unit 37 of each contact units 31a-31e, and connects the checking probes 33a-33e to an electrode 24.
[0059] At this time, as for each end cams 44a-44e, the cam ratio is set as :(X1/L) (X2/L):(X3/L):(X4/L): (X5/L). Therefore, only the amount based on amount of gaps deltaL and the cam ratio of each end cams 44a-44e moves the movement magnitude of each contact units 31a-31e.
[0060] And the movement magnitude of each contact units 31a-31e becomes almost equal to the amount of gaps of each electrode groups 25a-25e. For example, it is less than 0.05 degrees of errors of a stepping motor 41. This is based on the drive number of steps per rotation of a stepping motor 41. And most, when movement magnitude is end-cam 44e set up greatly, that movement magnitude shall serve as max, when that 180 degrees end-cam 44e rotates, and this movement magnitude shall be set as 2mm. Then, the error of the movement magnitude in this case is set to abbreviation 0.5x10^-3mm (= 0.5 microns). Since it is very small compared with the electrode width of face W (= 0.15mm) and the electrode pitch P (= 0.3mm), effect does not have the error of this movement magnitude in connection of an electrode 24 and the checking probes 33a-33e.
[0061] And after connection between the checking probes 33a-33e and an electrode 24 is completed, a control device 12 supplies a checking electrical signal to the examined panel 23 through each checking probes 33a-33e

from power circuit 12a, makes the examined panel 23 turn on, and inspects the examined panel 23.
[0062] In addition, in drawing 1 , only the device which carries out alignment of the checking probes 33a-33e to the electrode formed in one side of the examined panel 23 is shown. And in fact, the electrode is formed in two or more sides of the examined panel 23, and the checking probe connected to the electrode formed each side is prepared. However, since the configuration and actuation of the alignment of a checking probe to the electrode formed each side are the same respectively, the drawing of the configuration to other sides and explanation of operation are omitted.
[0063] According to the gestalt of this operation, the following effectiveness is done so as described above.
(1) In the side of the examined panel 23, the electrode groups 25a-25e which consist of two or more electrodes 24 estrange mutually, and two or more formation is carried out in it. The panel testing device 10 is equipped with the contact units 31a-31e corresponding to each electrode groups 25a-25e. Each contact units 31a-31e are equipped with the checking probes 33a-33e connected to two or more electrodes 24 which constitute the electrode groups 25a-25e, respectively, and it is prepared in the location corresponding to two or more electrode groups 25a-25e, respectively. Moreover, the cam followers 35a-35e with which each contact units 31a-31e were equipped are contacted by the end cams 44a-44e to which the amount of displacement was set, respectively according to a ratio with the distance to the location which represents each electrode groups 25a-25e from reference-terminal 24a and electrode 24a used as the distance L between 24b, and the criteria set up beforehand, respectively. And the control unit 12 measured the amount of gaps of the examined panel 23, and only the include angle according to the amount of gaps carries out the rotation drive of the end cams 44a-44e, and it was made to move each contact units 31a-31e based on the image obtained with cameras 51 and 52.
[0064] Consequently, since each contact units 31a-31e move as they responded to the amount of gaps of each electrode groups 25a-25e, they move each contact units 31a-31e to the location which faces each electrode groups 25a-25e. Therefore, even if the location of an electrode 24 shifts by effect, thermal expansion, etc. of heat treatment of the large-sized examined panel 23, precision can improve each electrode groups 25a-25e and each contact units 31a-31e alignment. And it is connectable with a precision sufficient to the electrode 24 aiming at the checking probes 33a-33e.
[0065] In addition, this invention may be carried out in the following modes besides the gestalt of said operation.
(1) In the above-mentioned operation gestalt, replace with end cams 44a-44e, and carry out using a cam with various solid cams, such as plane cams, such as a face cam and a grooved cam, a cylindrical cam, and a conical cam, etc.
[0066] (2) Although the proportionality migration means to which each contact units 31a-31e are moved according to the amount of gaps of the electrode groups 25a-25e using end cams 44a-44e, respectively was constituted from an above-mentioned operation gestalt, the configuration of the migration means may be suitably changed into the configuration using a pulley, a link mechanism, etc., and may be carried out.
[0067] For example, as shown in drawing 4 , the main working side pulley 51 really attached in the shaft 43 pivotable and the follower side pulley 52 formed in the contact unit 31a side are connected by the timing belt 53. A ball screw 54 is really attached in the follower side pulley 52 pivotable, and contact unit 31a moves to it along with guide-rail 34a through the joint section 55 according to rotation of the ball screw 54. And the radius of the main working side pulley 51 is proportionally changed-like according to the location of each contact units 31a-31e. By this configuration, the same effectiveness as the above-mentioned operation gestalt is done so.
[0068] Moreover, in the configuration shown in drawing 4 , the radius of the main working side pulley 51 is made the same in each contact units 31a-31e, and the radius of the follower side pulley 52 is changed-like proportionally. Moreover, the radius of the main working side pulley 51 and the follower side pulley 52 is made the same, and the pitch of a ball screw 54 is changed. Furthermore, make the radius of the follower side pulley 53 the same, and let movement magnitude of the contact units 31a-31e be proportionality with the main working side pulley 51 and the pitch of a ball screw 54. Furthermore, the movement magnitude of a contact unit is set up again with the follower side pulley 52, a ball screw 54 and the main working side pulley 51, the follower side pulley 52, and the pitch of a ball screw 54. In any case of these, the same effectiveness as the above-mentioned operation gestalt is done so.
[0069] (3) Equip each contact units 31a-31e with a stepping motor 41 in the above-mentioned operation gestalt. In this case, only the same include angle carries out the rotation drive of the stepping motor with which each contact units 31a-31e were equipped in the end cams 44a-44e of the above-mentioned operation gestalt, and

each end cams 44a-44e are rotated.
[0070] Moreover, the end cams 44a-44e of each contact units 31a-31e are made into the same configuration (the amount of displacement is the same), and a control unit 12 sets the pulse number which drives the stepping motor with which each contact units 31a-31e were equipped, respectively as the value proportional corresponding to each units 31a-31e, and supplies it to each stepping motor. Also by this configuration, movement magnitude serves as proportionality, respectively and each contact units 31a-31e can improve [precision] the checking probes 33a-33e alignment to an electrode 24.
[0071] (4) With the above-mentioned operation gestalt, although the case of five contact units 31a-31e was explained, change the number of contact units into four or less pieces or six pieces or more suitably, and carry it out, for example.
[0072] (5) Apply to test equipment, such as flat-surface display panels other than PDP, for example, a liquid crystal display panel, (LCD), the EL (electro luminescent display) panel, and FED, as an examined panel 23 in the above-mentioned operation gestalt.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The outline block diagram of the display-panel test equipment of this invention.
[Drawing 2] The outline side elevation of a contact unit.
[Drawing 3] (a) The perspective view of **********, and (b) (a) Cam diagram.
[Drawing 4] The outline top view of another contact unit.
[Drawing 5] the part which shows the electrode of a flat-surface display panel -- an enlarged drawing.
[Description of Notations]
12 Control Unit as the Amount Measurement Means of Gaps, Proportionality Migration Means, Range Measurement Means, Difference Operation Means, and a Driving Means
23 Examined Panel
24 Electrode
25a-25e Electrode group
31a-31e Contact unit
33a-33e Checking probe
34a-34e Guide rail as a proportionality migration means
35a-35e Cam follower as a proportionality migration means
37 Clamp Unit
41 Stepping Motor as a Driving Means
43 Shaft as a Proportionality Migration Means
44a-44e Cam as a proportionality migration means (end cam)
51 52 Camera as an amount measurement means of gaps

[Translation done.]

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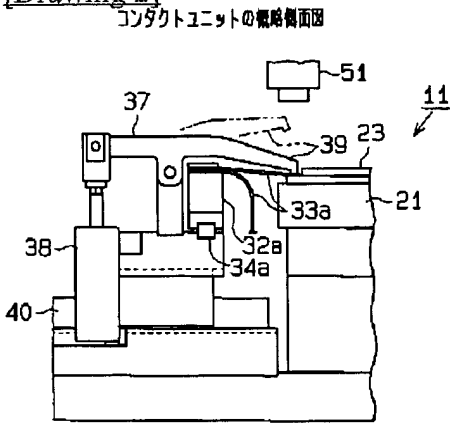
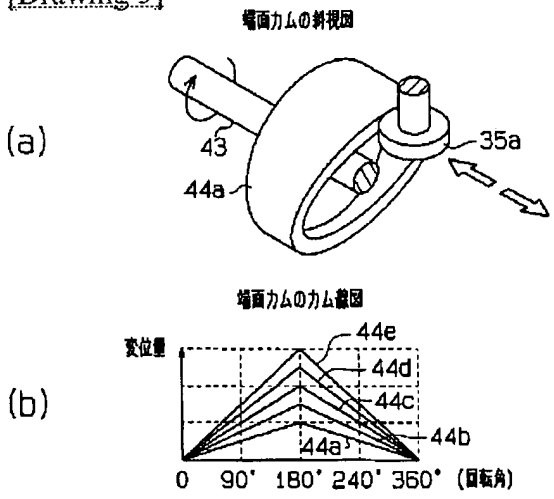
DRAWINGS

[Drawing 2]

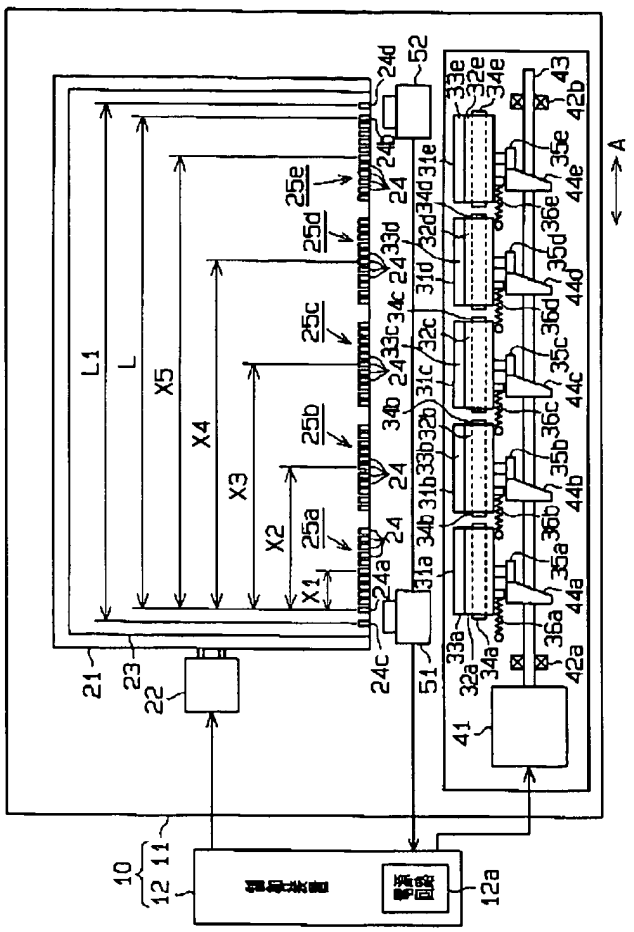


[Drawing 3]



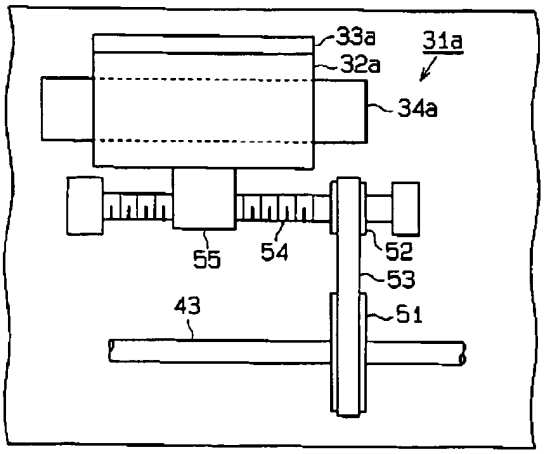
[Drawing 1]

本発明のパネル検査装置の概略構成図



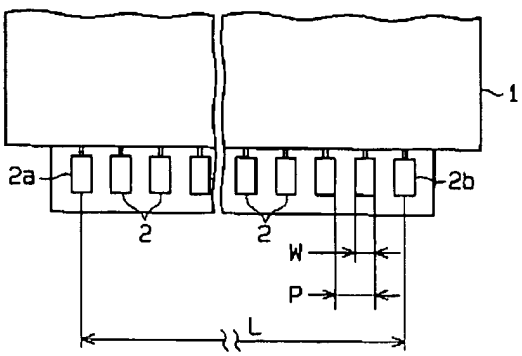
[Drawing 4]

別のコンタクトユニットの概略平面図



[Drawing 5]

平面表示パネルの電極を示す一部拡大図



[Translation done.]